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THE MEASUREMENT AND REINFORCEMENT OF BEHAVIOR OF PSYCHOTICS[1]

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An attempt was made to strengthen behaviors of psychotics by applying operant reinforcement principles in a mental hospital ward. The behaviors studied were necessary and/or useful for the patient to function in the hospital environment. Reinforcement consisted of the opportunity to engage in activities that had a high level of occurrence when freely allowed. Tokens were used as conditioned reinforcers to bridge the delay between behavior and reinforcement. Emphasis was placed on objective definition and quantification of the responses and reinforcers and upon programming and recording procedures. Standardizing the objective criteria permitted ward attendants to administer the program. The procedures were found to be effective in maintaining the desired adaptive behaviors for as long as the procedures were in effect. In a series of six experiments, reinforced behaviors were considerably reduced when the reinforcement procedure was discontinued; the adaptive behaviors increased immediately when the reinforcement procedure was re-introduced.

Recent research has pointed to the use of operant conditioning principles to develop voluntary behaviors of humans (Skinner, 1954; Lindsley, 1956; Holland, 1958; Long, Hammond, May, and Campbell, 1958; Ellis, Burnett, and Pryer, 1960; Bijou and Orlando, 1961; Ferster and DeMyer, 1961; Hutchinson and Azrin, 1961; Weiner, 1962; Holz, Azrin, and Ayllon, 1963). Most of the practical clinical applications have been characterized by attention to a single response, use of a single reinforcing stimulus, short and infrequent sessions, implementation by a trained psychologist, and application to a single patient at one time (Flanagan, Goldiamond, and Azrin, 1958; Ayllon and Michael, 1959; Williams, 1959; Isaacs, Thomas, and Goldiamond, 1960; Brady and Lind, 1961; Barrett, 1962; Baer, 1962; Ayllon, 1963; Wolf, Risley, and Mees, 1964). These characteristics possess inherent limitations in solving clinical problems. Limitations of time and expense are less serious than limitations of effectiveness that may result from employing only a single type of reinforcer during infrequent and brief sessions. Possibly the most important limitation for a general technology of behavior is the lack of standardization when scarce professional personnel are required to record behavior, devise procedures and interpret results, all according to criteria that may be subjective and idiosyncratic.

The present study attempted to reinforce many kinds of behavior in mental patients with many kinds of reinforcers. It used a standardized procedure requiring only nonprofessional personnel and covered a large number of patients for long periods of time. This was done in a controlled setting such as that used by Ayllon and Haughton, (1962) and Ayllon and Azrin, (1964).

METHODOLOGY

Selecting and Defining the Response

Responses were chosen which were necessary or useful to the patient, *e.g.*, serving meals, cleaning floors, and sorting laundry. Some of these are hard to measure objectively. For example, continuous recording of all conversation by all patients is impractical. Behaviors that produce a fairly permanent, physically identifiable change in environment, *e.g.*, wash-

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ing dishes, mopping floors, and serving meals can, however, be defined. The net result of washing dishes is obviously the cleanliness of the dishes. Conversation among patients washing dishes may be necessary to the task, but the end product of this communication would be the response to be recorded. To record the selected responses, the environment was arranged so that they could be emitted only at a designated time and place. For example, a mop would be made available only at a specified hour of the day and for a specified duration. Even though continuous recording is impractical, some responses that can be performed at any time, *e.g.*, self-grooming, should be measured continuously. According to the principle of stimulus control, a response is most likely to occur at the anticipated or usual time and place of reinforcement of that response (Ferster and Skinner, 1957). The procedure adopted for such behaviors as self-grooming was to reinforce the response at a specified time and place and to measure the response concurrently with the reinforcement procedure. In this way, if the reinforcement procedure was effective, the record of the response would be obtained at the time and place the response was most likely to occur.

Selecting and Defining the Reinforcer

Only those reinforcing stimuli which could be specified objectively and consistently were selected. An example of this type of reinforcer would be a change of sleeping quarters for the patient. Existing reinforcers were preferred over reinforcers that were not part of the naturalistic context. Effectiveness was the most important consideration in selecting reinforcers.

One of the primary characteristics of psychotic patients is the apparent absence of any effective reinforcers for them. No *a priori* decisions were made about what should be an effective reinforcer. Instead, patients' behavior was used to discover reinforcers. What the patients did, or tried to do, was observed throughout the day when no outside pressures were present. For example, patients might continuously hoard various items under their mattresses, stay at the exit to the ward and try to leave, frequently request special interviews with the social worker or ward psychologist, or push their way into the cafeteria in order to eat before the others.

The general principle expressed by Premack (1959) that any behavior with a high frequency of occurrence can be used as a reinforcer has been verified in almost all operant conditioning studies, especially those involving chained schedules (Kelleher and Gollub, 1962). In accordance with this, behaviors of high natural frequency were arranged as reinforcers by allowing the patients to engage in them at a scheduled time.

The procedure for recording delivery of reinforcers was similar to that for recording responses. Reinforcers were delivered only at specified times and places, and only those that produced enduring changes in the environment were selected, *e.g.*, the opportunity to leave the ward for a walk. The occurrence of such a reinforcer could be easily measured in terms of the presence or absence of the patient on the ward.

Programming

Operant conditioning methodology requires delivery of the reinforcing stimulus immediately after the response. If the response is operating a dishwasher, and the reinforcer is a special interview with the psychologist, delivery of the reinforcer after the response would require that the psychologist be continuously available, a clearly impractical requirement. A conditioned reinforcer was therefore used to bridge the delay between response and reinforcement. It has already been demonstrated, *e.g.*, Kelleher (1957), that a conditioned stimulus can be used to reinforce behavior when it follows the response. The reinforcing stimulus need only be exchangeable later for the conditioned reinforcer. Special metal tokens were used as conditioned reinforcers. Their unique physical characteristics guaranteed that they could not be obtained outside the ward. When the selected response was performed, the attendant gave the token to the patient. The token could be exchanged later during the day or even on subsequent days or weeks for the reinforcing events. Credits, points, merits, money *etc.*, could have fulfilled the same function.

EXPERIMENTAL EVALUATION

A. Experimental Design

After 18 months of preliminary development, six experiments were conducted to de-

termine the effectiveness of the reinforcement procedure in maintaining the desired behavior. The behavior studied was the performance of work which patients could select from a posted list of jobs.

The first experiment studied the influence of the reinforcement procedure on the patient's choice of jobs from among those within the hospital but outside the ward. The second experiment studied the absolute level of performance on these jobs. The third was similar to the second, but studied performance of jobs on the ward. In Exp IV, the relationship between the token reinforcers and the other reinforcers was discontinued. The fifth experiment studied the choice of on-ward jobs. Experiment VI studied the effect of the reinforcement procedure and of staff interaction on choice of off-ward jobs.

All experiments followed the A-B-A experimental design in which each subject served as its own control. This eliminated the need to compare patients, and made it possible to take any spontaneous changes into account. During each experiment, the regular incidental activities of the ward were maintained. No change in medication, especially tranquilizers, was initiated, no patients were added or discharged, and no change was made in the ward staff.

This type of research holds several potential sources of variability. One is the interaction between patients and general hospital staff. These influences were minimized because the chronic nature of the patients' illness discouraged various hospital services from including them in activities. Another source of variability is the interaction between patients and their relatives or friends. This was of little or no consequence in this study because such visits averaged fewer than three per year for each patient.

Possible influence of the investigators was minimized by implementing the reinforcement procedure through attendants who functioned in a standardized manner. Direct interaction between patients and investigators was held to a minimum and consisted primarily of observation.

Preliminary Experiments

Procedures were first tested and revised during a period of 18 months. Definitive evaluation of the method was provided in the six experiments after this period.

Ward Setting. As shown in Fig. 1, the ward contained five dormitories, a dining room, a recreation room or day room which adjoined the dining room, a nurse's station, ward offices for the registered nurse and the psychologist, and an examining room.

Special Equipment. To enable the staff to observe activities in the dining room, day room, corridors, and in one of the dormitories, one-way mirrors were placed in three of the rooms. Microphones at several locations permitted monitoring by the staff. They were used only during the first 18 months. Two movable turnstiles (Super Kompak Coinpassor Model #67) regulated entrance and exit into specified areas. The turnstiles were operated by the previously described tokens. The recreation room had a token-operated TV set. Insertion of one token turned the set on for 15 min.

Staff. The ward staff included a physician, a nurse, a psychologist, and the attendants. In addition to her medical duties, the nurse

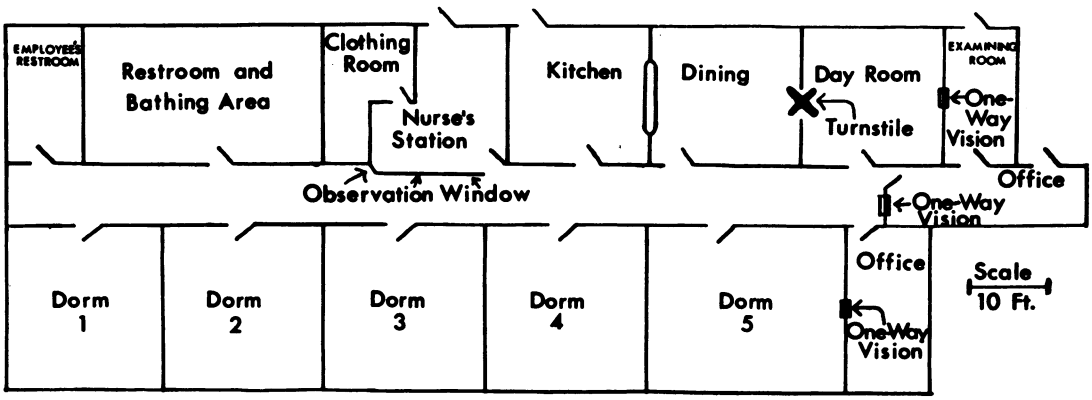

Fig. 1. Experimental ward floor plan.

supervised implementation and administration of the behavioral procedures. The attendants carried out the behavioral procedures under the direction of the psychologist and nurse in accordance with verbal and written instructions. An average of two attendants worked the day shift (6:30 a.m.-3:00 p.m.) and afternoon shift (2:30 p.m.-11:00 p.m.). One attendant served the night shift (11:00 p.m.-7:00 a.m.).

Patients. Ward population varied from 43 to 45 female mental patients. Patients not receiving therapy (except for tranquilizers) and who did not have hospital work assignments were selected. Therapy is meant to comprise individual, group, occupational, counseling, rehabilitation, recreational, industrial, shock, insulin, and metrazol therapy. These restrictions resulted in the selection of patients that had been hospitalized for long durations. A secondary criterion excluded any debilitating medical condition which might require periodic confinement to the medical wards.

B. Reinforcement Procedure

Table 1 describes the types of reinforcers and the number of tokens required for each. The available reinforcers are grouped in six main categories: privacy, leave from the ward, social interaction with staff, devotional opportunities, recreational opportunities, and commissary items.

The privacy reinforcers included five types of items or events that increase or restrict contact with other patients. (1) *Choice of bedroom.* Approximately 7-11 patients were in each of the bedrooms at different times. Each patient could daily choose a bedroom, and, indirectly, her roommates, by exchanging the appropriate number of tokens. The requirement was four tokens for one room, eight for another, 15 for a third, and 30 for still another. The fifth bedroom did not require tokens. Typically, patients who did not select bedrooms were placed in the free room. (2) *Choice of eating group.* The four

Table 1

List of Reinforcers Available for Tokens

	No. of Tokens Daily
I. Privacy	
Selection of Room 1	0
Selection of Room 2	4
Selection of Room 3	8
Selection of Room 4	15
Selection of Room 5	30
Personal Chair	1
Choice of Eating Group	1
Screen (Room Divider)	1
Choice of Bedspreads	1
Coat Rack	1
Personal Cabinet	2
Placebo	1-2
	Tokens
II. Leave from the Ward	
20-min walk on hospital grounds (with escort)	2
30-min grounds pass (3 tokens for each additional 30 min)	10
Trip to town (with escort)	100
III. Social Interaction with Staff	
Private audience with chaplain, nurse	5 min free
Private audience with ward staff, ward physician (for additional time —1 token per min)	5 min free
III. Social Interaction with Staff—Cont.	
Private audience with ward psychologist	20
Private audience with social worker	100
IV. Devotional Opportunities	
Extra religious services on ward	1
Extra religious services off ward	10
V. Recreational Opportunities	
Movie on ward	1
Opportunity to listen to a live band	1
Exclusive use of radio	1
Television (choice of program)	3
VI. Commissary Items	
Consumable items such as candy, milk, cigarettes, coffee, and sandwich	1-5
Toilet articles such as Kleenex, toothpaste, comb, lipstick, and talcum powder	1-10
Clothing and accessories such as gloves, headscarf, house slippers, handbag, and skirt	12-400
Reading and writing materials such as stationary, pen, greeting card, newspaper, and magazine	2-5
Miscellaneous items such as ashtray, throw rug, potted plant, picture holder, and stuffed animal	1-50

eating groups for each meal had 5-15 patients in each at different times. All patients who did not select an eating group ate in the last group. (3) *Choice of a personal cabinet.* Each patient could secure daily a locked cabinet in which to store her belongings. (4) *Choice of a personal chair.* In securing a chair and keeping it in her bedroom, each patient avoided sharing the chair or having it appropriated by other patients. (5) *Choice of a room divider.* A screen or room divider was typically used to shield the patient's bed and immediate space from view of other patients.

Reinforcers in the second category gave the patient the opportunity to leave the ward with or without an escort. When the patient chose to leave the ward with an escort, her stay was limited. When she chose to leave unescorted, she could extend her stay by exchanging tokens for a corresponding number of minutes. A greater number of tokens permitted visiting the neighboring town with an escort for approximately 1 hr.

Reinforcers in the third category enabled the patient to secure a private audience with a member of the hospital staff. A 10-min private meeting could be extended by exchanging tokens for any additional time desired. No tokens were required for the first 5 min of social interaction with the ward physician, nurse, and hospital chaplain. This unrestricted access was designed to safeguard patient health and well-being.

The fourth category allowed the patient to take active part in religious services of her choice. Access to the weekly religious service, conducted on the ward by the hospital chaplain, was gained through a token-operated turnstile. Religious services off the ward were also available to patients through token exchange.

The fifth category included events and items which allowed the patient to relax in leisure, such as the opportunity to attend movies shown on the ward, to listen to a live band, and to have the exclusive use of a radio or a television set. Hospital-wide activities, such as dances, were also available through the exchange of tokens.

The sixth category of reinforcers consisted of personal belongings, including consumable items, extra clothing and grooming accessories, reading and writing materials, and a choice of items by special request. Among the items requested were stuffed animals, potted plants, a bird cage, a parakeet, and a watch.

C. Token Exchange

Patients could exchange tokens to secure the reinforcement at the commissary and at the nurse's station. Most of the token exchange took place at the commissary. Three times each day (9:30 a.m., 2:00 p.m., 8:30 p.m.), a commissary period was held in the ward dining room. Transactions could be made only during these periods of approximately 45 min. The morning commissary provided only edible and consumable items such as coffee, milk, cigarettes, and newspapers and magazines. The afternoon and evening commissary provided the entire range of items.

To obtain items from the commissary, a patient deposited a token in the turnstile, waited her turn in line, and requested desired items. Under the immediate supervision of an attendant, two patients operated the commissary. One patient made the proper exchanges of tokens and goods, the other recorded the transaction. Patients could obtain as many items as they had tokens for and could make as many trips to the exchange counter as they wished. At the end of the commissary period, the patients who operated the commissary tabulated the number and types of items dispensed and the number of tokens exchanged by each patient. This record was presented to the attendant, who in turn checked it against her own record. Both records were filed to allow cross-checking.

Transactions at the nurse's station concerned renewal of all those items classified as privacy and leave from the ward, and appointments were made to engage in social interaction. An attendant recorded the transaction and the time and name of the individual involved.

EXPERIMENT I

This studied the relationship of the ward reinforcement procedure to the performance of patients on off-ward assignments. In any mental hospital, patients do accept job assignments without any apparent extrinsic reinforcement other than that deriving from some intangible job satisfaction. It is thus unwarranted to conclude that the reinforcement procedure was responsible for maintaining the

patients' performance solely from the evidence that the performance occurred and was followed by reinforcement with tokens. For example, when asked why they were working at a particular assignment, patients frequently responded in terms of the attractiveness of the job location, the "nice" people with whom they worked, the satisfying nature of the work itself, or the personal satisfaction derived from being of general benefit to the hospital. It seems reasonable to assume that these uncontrolled reinforcers were acting on the patient. This experiment sought to determine if the uncontrolled reinforcers were responsible for job selection. If the ward reinforcement procedure exerted no greater control than the uncontrolled reinforcers, eliminating the reinforcement should make little difference to job selection. On the other hand, if the ward reinforcement procedure was important, removing the reinforcement should be expected to change job selection. The speed and extent to which patients changed jobs when the reinforcement procedure was changed should provide an index of the strength of the controlled reinforcement relative to the uncontrolled.

Patients

Age, duration of hospitalization, diagnosis, and medication of the eight patients studied are presented in Table 2. Five were classified as schizophrenic, and three as mental defective. Their mean age was 47 with a range of 33 to 72. The mean duration of continuous hospitalization was nine years. Five were receiving no tranquilizers and three were on a maintenance dosage of phenothiazine derivatives.

Response

The response consisted of the performance of off-ward work assignments. Table 3 shows the types and numbers of jobs as well as the approximate duration of each and the tokens available per job. Patients were eligible for these jobs upon request. Each job typically required 6 hr of work daily, five days a week, under conditions similar to regular outside employment. Each had a definite starting and quitting time, was performed under supervision, and involved duties that were indispensable for the day-to-day functioning of the hospital. Equivalent duties were being performed by paid hospital personnel with whom the patient worked.

A printed list of jobs containing a work description and the tokens available at its completion was shown to patients each week. At that time the patient selected a job by contacting the nurse and volunteering for the desired job. The final assignment of jobs was regulated by the supply and demand of volunteers for specific positions. During the initial period of preliminary development, it was found helpful to rotate jobs weekly so that each patient had the opportunity to become familiar with the different jobs.

Procedure

The automatic job rotation was discontinued for the duration of Exp I. The patient could engage in a preferred job in contrast

Table 2

Age, Years of Hospitalization, Diagnosis and Drugs for the Eight Patients Studied in Experiment I

Subject	*Age*	*Years of Hospitalization*	*Diagnosis*	*Tranquilizing Drugs*
S-1	60	5	schizophrenic reaction, hebephrenic type	none
S-2	33	6	mental defective, moderate	phenothiazine derivative
S-3	42	2	mental defective, moderate	none
S-4	37	6	schizophrenic reaction, chronic undifferentiated type	phenothiazine derivative
S-5	72	8	schizophrenic reaction, paranoid type	phenothiazine derivative
S-6	37	8	schizophrenic reaction, chronic undifferentiated type	none
S-7	44	12	mental defective, moderate	none
S-8	55	29	schizophrenic reaction, hebephrenic type	none

Mean Age: 47 Range: 33-72 Years

Mean Years of Hospitalization: 9 Range: 2-29

Table 3
Types and Number of Off-Ward Jobs

Types of Jobs	*# of jobs*	*Duration*	*Tokens paid for each job*
Dietary Worker Helps serve meals for 85 patients and cleans tables after meals.	1	6 hr daily	70
Clerical Types and answers the telephone. Calls hospital personnel to the telephone.	2	6 hr daily	70
Laboratory Cleans cage pans, fills water bottles and cleans floor in laboratory.	2	6 hr daily	70
Laundry Helps to run sheets, pillow cases and towels through mangle at hospital laundry. Also folds linens.	3	6 hr daily	70

to a non-preferred job. Reinforcement was withdrawn from the preferred job and scheduled for the non-preferred job. The basic design was as follows:

	Preferred job	*Non-preferred job*
Phase I	reinforcement	extinction
Phase II	extinction	reinforcement
Phase III	reinforcement	extinction

Each phase consisted of 10 consecutive days. Each patient was given verbal instructions daily by an attendant as follows:

> "We want you to know that the people you are working for are very pleased with your job and would like you to continue working there. We have a problem though. Other patients want to work there also, but we can't pay them because we have a limited number of tokens for the jobs in the laundry (lab., dietary, office). So to be fair to everyone, we're going to give you a choice: you can continue working in the laundry but you won't get any tokens for it, or you can volunteer for another job where we have tokens available for work. One job that is still open is the dietary (lab., office). Anyone working there gets 70 tokens daily. Now, remember the choice is all yours. Do you want to choose now?"

During Phase III, the patient was told by a ward attendant that her current (non-preferred) job no longer paid tokens but that her previous (preferred) job was available for token reinforcement.

Results

Figure 2, for seven of the eight patients, shows that when the reinforcement was shifted from the preferred job to the non-preferred, the shift in performance from the preferred to the non-preferred job was immediate and complete and endured for the entire 10-day period of Phase II. The return to the preferred assignment was equally abrupt and complete when the token reinforcement was reinstated for the preferred assignment on the 20th day.

The results for the eighth patient, S-5, are presented separately in Fig. 3, since the experimental design was altered for her. Unlike the other seven patients, S-5 did not shift her job assignment upon the shift in reinforcement. The patient was allowed to remain in the preferred but unreinforced job for an additional time. She did change her choice of job assignment on the 21st day and continued on the non-preferred job to the 30th day. When on the 31st day the reinforcement was changed back to the preferred response, she immediately selected the preferred job.

Initially, several patients had explained their choice of the preferred job assignment on the basis of job satisfaction and social contact. When the non-preferred assignment was reinforced on the 11th day, however, the statements indicated that these uncontrolled reinforcers were not playing an important role. One patient commented: "No, honey, I can't work at the laundry for nothing, I'll

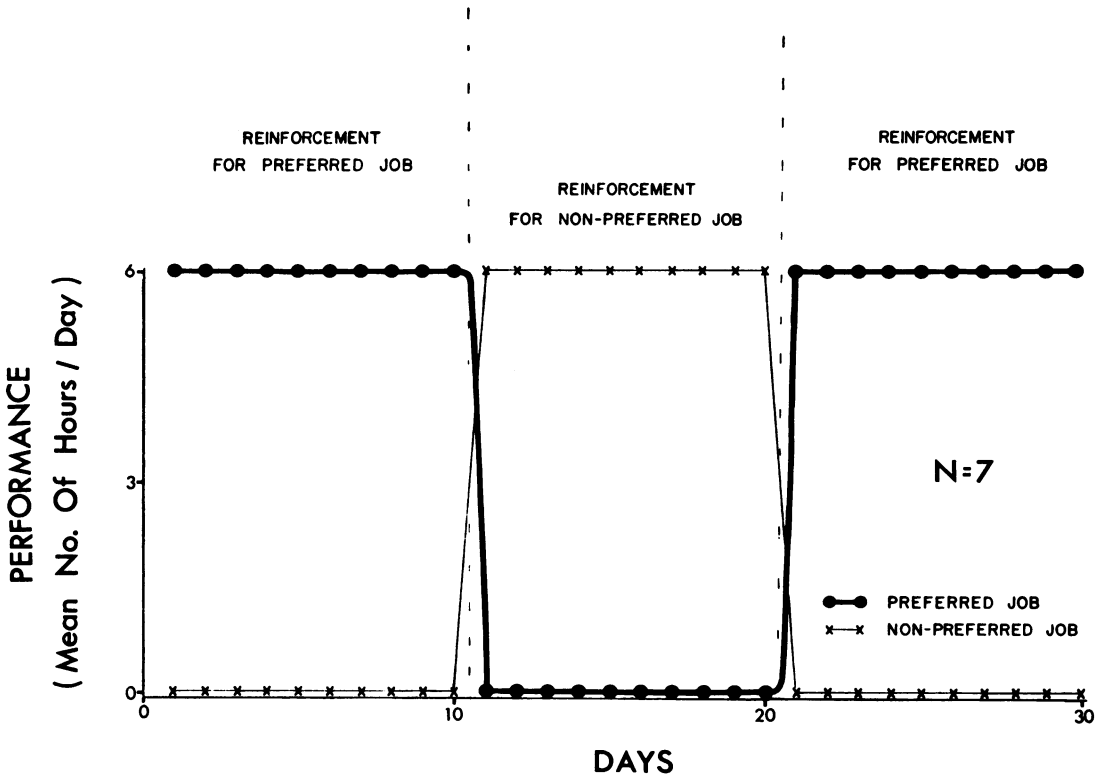

Fig. 2. Mean number of hours of performance by seven of eight patients.

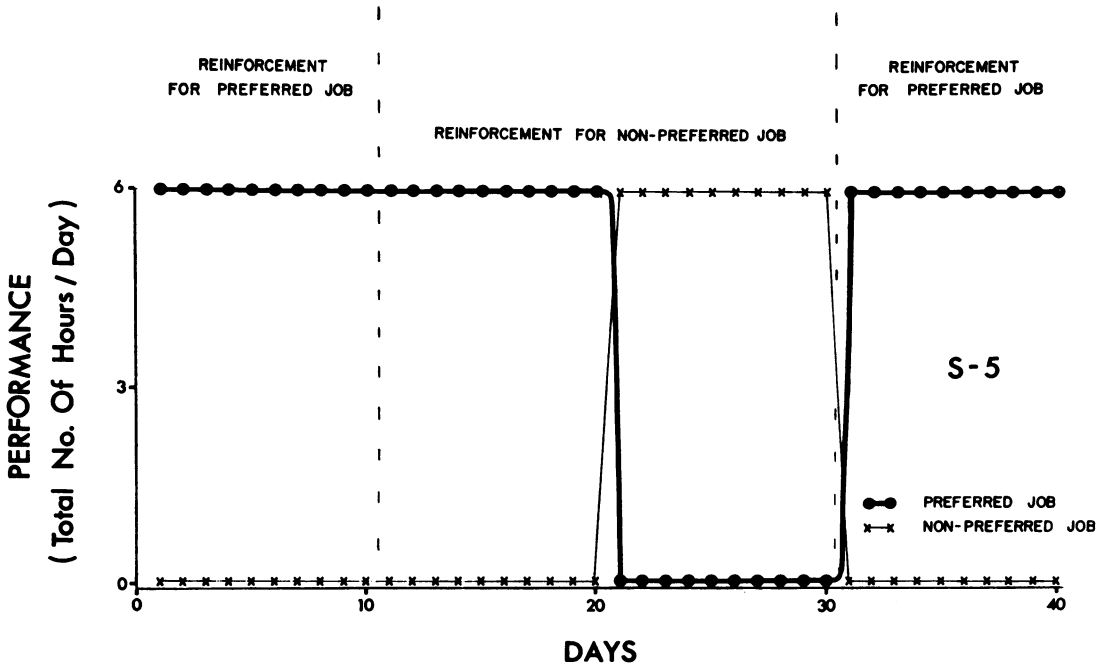

Fig. 3. Number of hours of performance by one patient, S-5.

work at the lab. I just couldn't make it to pay my rent, if I didn't get paid." Another commented: "You mean if I work at the lab, I won't get paid? I need tokens to buy cigarettes for my boy friend and to buy new clothes so I'll look nice like the other girls." Other comments showed the strength of the token reinforcement relative to any uncontrolled reinforcement.

S-5 said to the attendant: "Doctor _____ needs me and I told him I'd do his typing next week, so I'll keep my work. I can live without tokens." This indication of the strength of the uncontrolled reinforcement was followed by a verbal indication of the ultimately greater strength of the token reinforcement on the 21st day when the patient selected the reinforced job assignment and simultaneously stated to the attendant: "I have finished the work that I promised to do for Doctor _____. I need the tokens and I don't mind working for you, but when I make a promise, I keep it."

Table 4 shows that a large number of tokens was expended by each of the eight patients during the 42-day period.

Discussion

The off-ward jobs were performed consistently. All eight patients reported promptly each day for 30 days. Their performance produced no complaints from the supervising employees. No requests were made for a day off or for time off for any reason. This contrasts markedly with the usually erratic and inconsistent performance of patients who voluntarily engage in hospital duties. The patients' verbal statements gave no indication that they were operating under coercion. They appeared to value their job assignments. Although the patients could at any time be free of their job assignment simply by not requesting it at the beginning of the day, no patient did so. The tokens fulfilled their intended function as mediator between the response and the reinforcement.

Preferences for one type of reinforcement over another were highly personal. A large number of events proved to be reinforcing.

The critical test of whether the tokens were conditioned reinforcers occurred when they were no longer provided for the preferred job but were for the non-preferred job. The immediate shift in performance of seven of the eight patients to the non-preferred job is dramatic evidence of the reinforcing properties of the tokens. The return to the preferred job when tokens were again available for it further confirms their effectiveness. The uncontrolled reinforcers provided by the preferred job assignment played a very slight role relative to the token reinforcers. Only one patient failed to change jobs immediately when the token reinforcement was changed from the preferred to the non-preferred job. For this patient, some uncontrolled reinforcement in the job assignment seemed to be evident. The verbal reactions of the patients paralleled their choice of assignment in indicating the strength of the token reinforcement. The results indicate, therefore, that the effect of token reinforcement was greater and more

Table 4

Amount of Tokens Exchanged by the Eight Patients Who Worked in Off-Ward Jobs (Experiment I)

Subject	*Privacy*	*Leave from ward*	*Social interaction with staff*	*Devotional opportunities*	*Recreational opportunities*	*Commissary*	*Total*
S-1	1824	617	20	0	8	691	3160
S-2	842	558	0	0	3	3196	4599
S-3	1716	642	0	0	0	1069	3427
S-4	1794	524	0	0	0	417	2735
S-5	1789	303	0	4	0	108	2204
S-6	278	1253	0	0	0	522	2053
S-7	1021	545	10	1	5	1055	2637
S-8	1554	489	0	0	3	699	2745
Total	10,818	4,931	30	5	19	7,757	23,560
Mean	1,352.25	616.37	3.75	.62	2.37	969.62	2,945.00

Note:—Based on 42 days including 30 workdays plus weekends.

enduring than any uncontrolled reinforcement provided by a particular job assignment.

EXPERIMENT II

Experiment I demonstrated that the token reinforcement procedure determined patients' job choices and overcame any uncontrolled reinforcement inherent in a particular job. The possibility still existed that work was intrinsically reinforcing *per se* and that the reinforcement procedure affected only the selection of jobs. Patients' statements that they are working because they like to keep active, that they like to contribute something to the hospital, or that "It's not good to be doing nothing" support this possibility. This experiment examined whether patients would cease working when the token reinforcement was discontinued for that work.

Discontinuing the token reinforcement for the job would, however, also terminate the patient-attendant interaction associated with obtaining the token. The experimental design selected, therefore, continued the attendant-patient interaction. The patients were given the usual number of tokens each day by the same attendant. The major difference was that tokens were given at the beginning of the day, before the job, rather than at the end of the day when the job was completed. Thus, the procedure involved non-contingent reinforcement rather than extinction.

Controlled laboratory studies (Skinner, 1938) have demonstrated that behavior that has been immediately reinforced will decline to a near zero level when the reinforcement is delivered on a non-contingent basis. This alters only the temporal dimensions of the response-reinforcement relationship while keeping constant the magnitude and frequency of reinforcement. It made it possible to evaluate the efficacy of the reinforcement without altering the complex patterns of behavior developed by the patients in utilizing the tokens.

Patients

The same eight patients used in Exp I (see Table 2) were studied.

Response

The response was the same as in Exp I: choice of off-ward job assignment. After Exp I, the automatic job rotation procedure was reinstated for approximately one and one-half months. For the duration of Exp II, only a single job opportunity was made available to each of the eight patients: the job spontaneously selected by the patient during Exp I, *i.e.*, the preferred job.

Procedure

Experiment II lasted 15 days. For the first five days, Phase I, 70 tokens were presented to the patient by the attendant when each day's job assignment was satisfactorily completed. For the next five days, Phase II, the same number of tokens was presented to the patient by the same attendant but before the patient left the ward for the job assignment. On the first day of Phase II, the attendant gave each patient the following instructions:

> "This week you are going to receive the usual 70 tokens before you go to work. In a sense, you will be getting a vacation with pay. You'll get your tokens daily even if you don't work. Of course, we're pleased with your work and would like you to continue working."

During this first day, several patients asked if they would receive extra tokens if they did work. Consequently, the instructions on subsequent days of Phase II contained the added statement that "you will not get extra tokens for working." On Days 11-15, the procedure of Phase I was reinstated. On each day of Phase III, the attendant stated to the patient:

> "The vacation with pay is over. From now on, you'll receive the usual 70 tokens after you've completed the job."

Results

During Phase I, when reinforcement was contingent upon performance, each patient completed the required 6 hr of work per day without lost time. On the sixth day, when reinforcement was no longer contingent upon performance, all patients stopped working. No work was done during the five days of Phase II.

The patients' comments when the non-contingent reinforcement started were: S-1: "You think I'm crazy to work without extra pay!" S-3: "I'll take the vacation. I can rest and get

paid too. How nice." S-6: "Oh boy! Now I can go out on my grounds pass every day."

When reinforcement was again made contingent upon performance (Phase III), the patients immediately began to work the full 6-hr day. The number of hours per day for each patient changed abruptly from 0.0 hr on Day 10 to 6.0 hr on Days 11-15. Some of the comments of the patients on Day 11 were: S-5: "Well, I enjoyed my vacation, but I'm ready to go back to work. I like to keep busy." S-6: "The vacation was nice, but I'll go to work. I need the tokens. I can go out on my grounds pass after work." S-7: "Will we get another vacation next year?"

Discussion

Little or no intrinsic reinforcement for work *per se* existed in the absence of the token reinforcement. Even for the one patient who stated that she liked to keep busy, this subjective tendency did not show in any performance during non-contingent reinforcement. It must be concluded, therefore, that the token reinforcement exerted almost complete control over whether a patient worked.

The absence of performance during non-contingent reinforcement appears to be attributable to the change in the response-reinforcement relationship: the ward procedure remained the same in all essential aspects. The absolute level of patients' performance can be drastically modified by arranging the token reinforcement procedure contingent upon performance.

EXPERIMENT III

Experiments I and II revealed that token reinforcement determined both the selection and performance of off-ward assignments. This experiment attempted to evaluate the effect of the token reinforcement in maintaining the on-ward activities of patients.

Several factors might have made off-ward assignments more sensitive to token reinforcement, *e.g.*, the magnitude of the response requirement. The off-ward assignments consisted of 6 hr of work per day; on-ward assignments were usually less than 1 hr. Further, the small number of tokens (usually fewer than 10) earned for any given on-ward assignment might not have had as much effect as the 70 tokens paid for off-ward assignments. A third factor is the apparently greater adjustment of the patients engaging in off-ward assignments. These patients, on gross observation, appeared to be more verbal, in greater social contact with their environment, and more adaptive to changing circumstances. On the other hand, even casual contact with most of the other patients usually revealed extensive behavioral deficits in both verbal performance and social adjustment. These less-adjusted patients might, therefore, be much less sensitive to the presence or absence of reinforcement than the apparently more-adjusted patients on off-ward assignments. In particular, the reduced level of patients' verbal behavior suggests that they might be less amenable to verbal instructions when the reinforcement contingencies were being altered.

The experimental design was similar to that used in Exp II in that the response-reinforcement relationship was maintained for a time, then removed, then reinstated. The effect of the reinforcement could be evaluated by comparing the on-ward work behavior of the patients when the response-reinforcement relationship was maintained with the time during which the response-reinforcement relationship was eliminated. As in Exp II, reinforcement was maintained but was delivered before instead of after job assignments were performed.

Subjects

The entire ward population of 44 patients served, including the eight patients from Exp I who were eligible for on-ward work on weekends and evenings. As shown in Table 5, the last diagnosis entered in the hospital records showed 37 schizophrenics, six mental defectives, and one patient suffering from chronic brain syndrome. The mean age was 51 years, with a range of 24-74. The mean length for continuous hospitalization was 16 years, with a range of 1-37. No tranquilizers were given to 27 of the 44 subjects during the investigation. A maintenance dosage of phenothiazine derivatives were administered to the other 17.

Procedure

Experiment III started 30 days after the end of Exp II. During the preliminary period, jobs were rotated as much as possible among the patients. During the experiment, once a patient had signed up for a job, she could not change.

The experiment lasted 60 days. During the first 20 days (Phase I) the patients worked at the job assignments selected. During the next 20 days (Phase II) verbal instructions were read from a printed card by the attendant every day as follows:

> "For the next few days you are going to receive your tokens for this work before you go to work. In a sense, you'll be getting a vacation with pay. You'll get your tokens each day whether or not you work. Of course, we are very pleased with your work and would like you to continue working; there will be no extra tokens for work."

Each patient was given the same number of tokens as she had earned during the first 20 days. During Phase III, the tokens were again made contingent upon performance of the on-ward assignment. The instructions read to the patient by the ward attendant were:

> "The vacation with pay is over. From now on you will receive the tokens for this job after you have completed the job."

On-Ward Responses

The on-ward jobs available to patients upon request involved duties required for the day-to-day functioning of the ward. Equivalent duties were typically performed by paid hospital personnel (attendants) on other wards. Table 6 describes the jobs and shows the approximate duration and number of tokens available for each. All jobs were supervised by an attendant, in some cases to make sure that the token transactions at the commissary were appropriate and to provide an independent record of transactions, and in other cases, to make sure a job was properly done. The available jobs were grouped in 11 major categories as follows:

Dietary assistant. Patients helped distribute food, clean and maintain the ward kitchen, usually interacting socially with other patients.

Waitress. Patients washed dishes, cups, and glasses, and cleaned dining room tables after meals and commissary.

Sales clerk. Patients organized and arranged all the necessary items for exchange at commissary. This required considerable social skills since the clerk had to wait on patients, count the tokens received from each and interact appropriately with the commissary assistant to complete the job properly.

Secretarial assistant. Patients recorded the names of all patients attending a scheduled activity. This required skills such as following instructions, reading, writing, and, sometimes, addition and subtraction. Patients performing these jobs had to know every patient by their last name. These jobs took place at a designated time and place under the continuous supervision of an attendant.

Ward cleaning assistant. Patients supplied each dormitory with mops, buckets, and brooms so that others could use them to clean their own rooms. They also swept and cleaned the ward and helped to care for a few patients who were incontinent.

Assistant janitor. The patient cleaned and maintained the ward and adjacent area, using ordinary housekeeping skills.

Laundry assistant. The patient helped collect soiled laundry and supply and distribute clean laundry. Skills in counting, folding linen, and clothing in general are necessary for these jobs.

Grooming assistant. Patients helped to wash, dress and groom other patients.

Recreational assistant. Patients helped to supervise scheduled leisure activities. Social interaction with patients and skill in operating a movie projector and record player are necessary for the satisfactory performance of these jobs.

Special services. Patients went on errands, conducted tours for visitors, and helped to prepare other patients for nursing care.

Self-care. The patient improved and maintained her own appearance and hygiene, wore clothing appropriately, washed and combed her hair, bathed, brushed her teeth, took part in light physical exercises, and made her bed, cleaning the area adjacent to it. The patients who helped in this were reinforced for helping. All patients could obtain tokens for self-care.

Approximately half the jobs could be performed by one person; the other half required cooperation among two or more persons. Tokens available for each job depended on supply and demand. For example, the janitor work took 180 min each day, but received only eight tokens, since many patients were

Table 5

Age, Years of Hospitalization, Diagnosis and Drugs for the 44 Patients Studied in Experiment III

Subject	*Age*	*Years of Hospitalization*	*Diagnosis*	*Tranquilizing Drugs*
S-1	60	5	schizophrenic reaction, hebephrenic type	none
S-2	33	6	mental defective, moderate	phenothiazine derivative
S-3	42	2	mental defective, moderate	none
S-4	37	6	schizophrenic reaction, chronic undifferentiated type	phenothiazine derivative
S-5	72	8	schizophrenic reaction, paranoid type	phenothiazine derivative
S-6	37	8	schizophrenic reaction, chronic undifferentiated type	none
S-7	44	12	mental defective, moderate	none
S-8	55	29	schizophrenic reaction, hebephrenic type	none
S-9	65	22	schizophrenic reaction, paranoid type	none
S-10	48	27	schizophrenic reaction, catatonic type	phenothiazine derivative
S-11	71	18	schizophrenic reaction, paranoid type	none
S-12	36	13	manic depressive psychosis, mixed type	phenothiazine derivative
S-13	56	1	schizophrenic reaction, paranoid type	none
S-14	58	7	schizophrenic reaction, mixed type	none
S-15	71	27	schizophrenic reaction, hebephrenic type	none
S-16	35	11	schizophrenic reaction, chronic undifferentiated type	none
S-17	45	10	mental defective, severe with psychotic reaction	none
S-18	55	25	schizophrenic reaction, paranoid type	none
S-19	50	13	schizophrenic reaction, paranoid type	none
S-20	74	37	schizophrenic reaction, chronic undifferentiated type	none
S-21	31	9	schizophrenic reaction, chronic undifferentiated type	phenothiazine derivative
S-22	59	4	schizophrenic reaction, chronic undifferentiated type	none
S-23	41	22	schizophrenic reaction, hebephrenic type	phenothiazine derivative
S-24	24	10	schizophrenic reaction, chronic undifferentiated type	phenothiazine derivative
S-25	37	19	schizophrenic reaction, hebephrenic type	phenothiazine derivative
S-26	61	13	schizophrenic reaction, paranoid type	none
S-27	44	8	schizophrenic reaction, chronic undifferentiated type	phenothiazine derivative
S-28	58	12	schizophrenic reaction, paranoid type	phenothiazine derivative
S-29	59	19	psychosis with syphilitic meningo encephalitis	none
S-30	42	15	schizophrenic reaction, mixed type	phenothiazine derivative
S-31	35	13	schizophrenic reaction, chronic undifferentiated type	phenothiazine derivative
S-32	46	16	schizophrenic reaction, paranoid type	phenothiazine derivative
S-33	39	20	schizophrenic reaction, hebephrenic type	phenothiazine derivative
S-34	47	8	schizophrenic reaction, paranoid type	phenothiazine derivative
S-35	62	29	schizophrenic reaction, catatonic type	none
S-36	61	27	schizophrenic reaction, mixed type	none
S-37	72	11	psychosis with cerebral arteroschlerosis	none
S-38	61	11	mental defective, severe	none
S-39	45	22	schizophrenic reaction, catatonic type	none
S-40	58	33	schizophrenic reaction, hebephrenic type	none
S-41	49	23	schizophrenic reaction, hebephrenic type	none
S-42	55	13	mental defective with psychotic reaction	none
S-43	47	22	schizophrenic reaction, hebephrenic type	phenothiazine derivative
S-44	64	30	schizophrenic reaction, catatonic type	none

Mean Age: 51 Range: 24-74 Years

Mean Years of Hospitalization: 16 Range: 1-37 Years

Table 6

Types and Number of On-Ward Jobs

Types of Jobs	*No. of Jobs*	*Duration*	*Tokens paid*
DIETARY ASSISTANT			
1. Kitchen Chores Patient assembles necessary supplies on table. Puts one (1) pat of butter between two (2) slices of bread for all patients. Squeezes juice from fruit left over from meals. Puts supplies away. Cleans table used.	3	10 min	1
2. Coffee Urn Patient assembles cleaning compound and implements. Washes five (5) gallon coffee urn using brush and cleaning compound. Rinses inside, washes and dries outside. Puts implements away.	1	10 min	2
3. Ice Carrier Patient goes with attendant to area adjacent to ward where ice machine is located taking along ten (10) gallon ice container. Scoops flaked ice from machine into container and carries it to the kitchen.	1	10 min	2
4. Shakers Patient assembles salt, sugar and empty shakers on table, fills shakers and puts supplies away.	2	10 min	2
5. Pots and Pans Patient runs water into sink, adds soap, washes and rinses all pans used for each meal. Stacks pans and leaves them to be put through automatic dishwasher.	3	10 min	6
6. Steam Table Patient assembles cleaning supplies. Washes and dries all compartments used for food. Cleans and dries outside of table. Places all pans in proper place on steam table.	3	10 min	5
7. Meal Server[a] Patient puts food into proper compartments on steam table. Assembles paper napkins and silver on counter placed at beginning of serving line, puts tablecloths, napkins, salt and sugar shakers on tables. Prepares proper beverage for each meal putting ice in glasses for cold beverages and drawing coffee from urn. Prepares proper utensils for dirty dishes and garbage. Dips food, places food and beverage on trays. Gives patients their trays. After the meal is over Dietary workers empty all leftover food and garbage, places all trays, glasses and silver used on cabinets ready for the dishwasher.	6	60 min	10
8. Dishwashers[a] Patient prepares dishwater, fills automatic dishwasher. Washes dishes, silver and glasses. Operates automatic dishwasher, washes cabinets, sinks and tables and puts everything away. Patient counts silver (knives, forks and spoons) for all patients and places them in containers ready for next meal.	9	45 min	17
WAITRESS			
1. Meals Empties trays left on tables and washes tables between each of four (4) meal groups.	6	10 min	2
2. Commissary Cleans tables, washes cups and glasses used at commissary. Places cups and glasses in rack ready for automatic dishwasher.	3	10 min	5

Table 6—(continued)

Types and Number of On-Ward Jobs

Types of Jobs	*No. of jobs*	*Duration*	*Tokens paid*
SALES CLERK ASSISTANT			
1. Commissary[a] Assembles commissary items. Displays candy, cigarettes, tobacco, cosmetics, dresses and other variety store items so that they can be seen by all. Prepares ice, glasses and cups for hot and cold beverages. Asks patient what she wishes to buy. Collects the tokens from patient and tells the secretary the name of the patient and the amount spent. Puts commissary supplies away.	3	30 min	3
SECRETARIAL ASSISTANT			
1. Tooth Brushing[a] Assists with oral hygiene. Writes names of patients brushing teeth.	1	30 min	3
2. Exercises[a] Assists recreational assistant with exercises. Writes names of patients participating in exercises.	2	30 min	3
3. Commissary[a] Assists sales clerk assistant. Writes names of patients at commissary, records number of tokens patient spent. Totals all tokens spent.	3	30 min	5
WARD CLEANING ASSISTANT			
1. Halls and Rooms Sweep and mop floors, dust furniture and walls in seven rooms and hall.	24	30 min	3
2. Special Cleans after incontinent patients.	1	30 min	4
3. Dormitories[a] Supplies each of five dormitories with the necessary cleaning implements. Fills buckets with cleaning water and delivers bucket of water, broom, mop and dust pan to each dormitory at a designated time. Picks up cleaning supplies and implements after a 30-min interval.	1	180 min	8
ASSISTANT JANITOR			
1. Supplies Places ward supplies in supply cabinets and drawers.	1	10 min	1
2. Trash Carries empty soft drink bottles to storage area, empties waste paper baskets throughout the ward and carries paper to container adjacent to building. Carries mops used during the day outside to dry.	3	5 min	2
3. Porch[a] Sweeps and washes walk adjacent to building. Washes garbage cans with soap and water.	2	10 min	2
4. Washroom Janitor Obtains necessary cleaning supplies and implements from utility room. Cleans four wash basins and four toilet bowls with cleanser and brush. Returns cleaning supplies and implements to utility room.	1	20 min	3
LAUNDRY ASSISTANT			
1. Hose Match and fold clean anklets and stockings.	1	15 min	1
2. Delivery Carries bags of dirty clothing and linens from ward to outside linen house adjacent to building.	1	10 min	2

Table 6—(continued)

Types and Number of On-Ward Jobs

Types of Jobs	No. of jobs	Duration	Tokens paid
3. Folding[a] Folds and stacks clean linens in neat stacks and takes it to the clothing room.	2	30 min	3
4. Pick Up Service[a] Sorts dirty clothing and linens and puts items into bags marked for each item.	1	60 min	8
GROOMING ASSISTANT			
1. Clothing Care Patient sets up ironing board and iron. Irons clothing that belongs to patients other than self. Folds clothing neatly. Returns ironed clothing, iron and ironing board to nurses station.	1	15 min	1
2. Personal Hygiene[a] Patient takes basket with grooming aids, gargle, paper cups, lipstick, comb, hairbrush and powder into patients' washroom. Patient stays with grooming basket and assists any who need help with their grooming before each meal. Returns grooming basket after the meal has ended.	3	60 min	3
3. Oral Hygiene[a] Assembles toothpaste, toothbrushes, gargle solution and paper cups. Pours gargle into cups and dispenses toothpaste or gargle to all patients.	1	20 min	3
4. Personal[a] Patient assists selected patients who need extra aid with personal grooming.	1	30 min	3
5. Bath[a] Patient assists with baths, washing, shampooing and drying. Cleans tub after each bath.	2	45 min	4
6. Beauty Aids[a] Assists in shampooing, setting and combing hair for patients who desire special service.	1	30 min	4
RECREATIONAL ASSISTANT			
1. Walks[a] Assists ward staff when taking group of patients on walks. Walks in front of group.	1	20 min	3
2. Exercise[a] Operates record player and leads patients in exercises.	1	20 min	3
3. Movie Projectionist Sets up movie projector and shows movie to patients. Changes reels and rewinds tape.	1	90 min	10
SPECIAL SERVICES			
1. Errands Leaves the ward on official errands throughout the hospital grounds, delivering messages and picking up supplies and records pertaining to the ward.	1	20 min	6
2. Tour Guide Gives visitors a 15-min tour of the ward explaining about the activities and token system. Answers visitors questions about the ward.	1	15 min	10
3. Nursing Assistant[a] Assists staff with the preparation of patients to be seen by the medical doctor. Assists staff with the control of undesired interaction between patients.	1	10 min	10

Table 6—(continued)

Types and Number of On-Ward Jobs

Types of Jobs	*No. of jobs*	*Duration*	*Tokens paid*
SELF-CARE ACTIVITIES			
1. Grooming Combs hair, wears: dress, slip, panties, bra, stockings and shoes (three times daily).			1
2. Bathing Takes a bath at time designated for bath. (once weekly)			1
3. Tooth Brushing Brushes teeth or gargles at the time designated for tooth brushing. (once daily)			1
4. Exercises Participates in exercises conducted by the exercise assistant. (twice daily)			1
5. Bed Making Makes own bed and cleans area around and under bed.			1

[a]Job requires two or more patients for its completion.

interested in this job. On the other hand, the dishwasher worked 45 min but earned 17 tokens, since fewer patients wanted this job.

Results

Figure 4 presents the total hours of work performed by the 44 patients during each of the 60 days, based upon the approximate duration of each job assignment as specified in Table 6, excluding self-care.

During Days 1-20, about 45 hr were spent each day performing job assignments. On the first day that the tokens were not contingent upon performance, the amount of work decreased to about 35 hr. On the third day, it decreased to about 20 hr, and by Day 36, had dropped to only 1 hr per day. When the tokens were again made contingent upon performance on Day 41, the time spent on job assignments increased immediately to 45 hr, approximating the level during the first 20 days. Performance was maintained at about 45 hr for the next 20 days (Days 41-60).

Table 7 shows that the responding of each patient decreased substantially when the reinforcement was not contingent on the responses, and increased substantially when reinforcement was again contingent. This was not true for those patients who began with a zero level of performance. A near-zero level of performance of eight patients was not altered by the changes in the reinforcement contingency. The remaining 36 patients showed reduced performance during the non-contingent reinforcement, and a substantial increase when the reinforcement was again made contingent.

Table 8 shows the number of tokens earned and spent during the first 20 days of Exp III. The number received during Days 21-40 and Days 41-60 was very similar and is not shown. During the 20-day period about 21,000 tokens were earned and spent, averaging about 500 per patient. The number earned within the

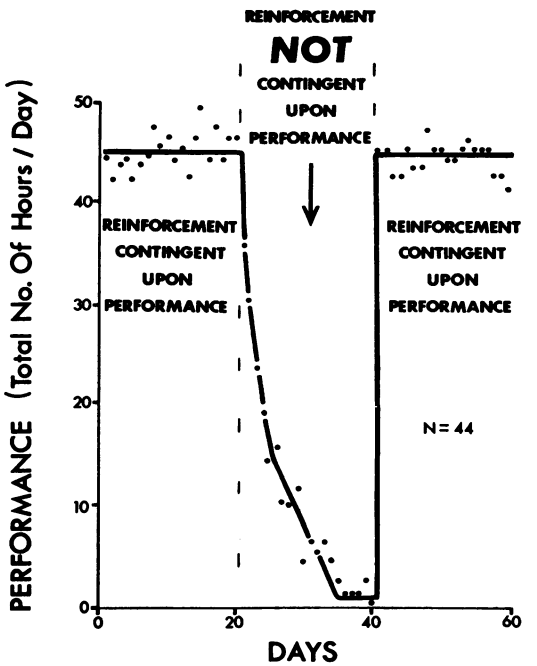

Fig. 4. The total number of hours of the on-ward performance by a group of 44 patients, Exp III.

Table 7

Performance of the Patients After Response-Reinforcement Relations Were Altered (Exp III)

	From contingent to non-contingent reinforcement	*From non-contingent to contingent reinforcement*
Number of patients showing an increase in performance.	0	36
Number of patients showing a decrease in performance.	36	0
Number of patients showing zero minutes of performance.	8	8
Total number of patients.	44	44

Note:—Based on the terminal five days for each phase.

20-day period was rarely equal to the number spent for any given patient. Patients often accumulated large numbers of tokens to make a desired exchange, and also would often lend or borrow tokens.

All patients earned and spent tokens. Of the 44 patients, 36 earned tokens from on-ward or off-ward assignments and for self-care. Of these 36 patients, 18 earned more than 300 tokens, the other 18 more than 80. Eight patients earned tokens only for self-care. They were relatively unaffected by the reinforcement program in terms of job assignments.

Earnings for off-ward assignments accounted for almost half of total earnings, whereas earnings for self-care accounted for only about 15% of the total. Although the reinforcement for self-care was initiated to maintain a minimum standard of cleanliness and personal hygiene, changes in the reinforcement contingencies produced no appreciable difference in self-care practices. The reduction in self-care during the non-contingent reinforcement procedure was no more than 10%.

The patients' comments paralleled the change in their work performance. Several patients continued working during the first few days of non-contingent reinforcement and made statements such as: "I think I'll work even if it is a vacation," or: "I want to help out here; there aren't enough people to do the work." Yet during the successive deliveries of the token reinforcement before each job with no extra tokens upon completion of the job, each patient gradually stopped performing the job assignments. A frequent comment during the latter stages of the non-contingent reinforcement was: "I'm not going to do any work if I don't get anything for it." When an attendant encouraged one patient to work, the patient replied: "Not if I don't get any extras, I won't."

Discussion

The on-ward work was not maintained without contingent token reinforcement. Patients were sensitive to the response-reinforcement relationship in spite of the fact that many had extremely low IQ's, a severe state of psychosis, and often a minimal level of verbal comprehension. The changes in verbal behavior paralleled those in Exp I and II. Although the patients frequently indicated that they had some intrinsic interest in their work, they showed a fairly strong lack of interest if no additional tokens were to be provided.

The change in the response-reinforcement relationship was effective in decreasing or terminating the patients' previously reinforced behavior. The need to maintain the response-reinforcement relationship was, therefore, general and not idiosyncratic to particular patients. For the eight patients who began with no behavior, no decrease in performance could result from the non-contingent reinforcement. Their only reinforced performances were in the self-care category. However, the self-care behaviors for all patients did not change appreciably when the tokens were made non-contingent. The reason for this is not known.

The present experiment, together with Exp II, demonstrated that reinforcement must be contingent upon desired performance, on-ward or off-ward, if the strength of that performance is to be maintained.

EXPERIMENT IV

The previous experiments attempted to ascertain the effect of the token reinforcement

Table 8

Number of Tokens Earned and Spent by the 44 Patients Studied in Experiment III

Subject	Tokens earned for: Off-ward jobs	On-ward jobs	Self-care	Total tokens earned	Tokens spent
S-7	1015	789	90	1894	1873
S-2	805	730	84	1619	2351
S-5	910	369	117	1396	999
S-3	1190	44	39	1273	1794
S-8	980	120	92	1192	2127
S-1	910	191	81	1182	1424
S-9	00	1032	142	1174	1189
S-6	1050	00	66	1116	938
S-22	00	954	88	1042	753
S-4	875	00	95	970	1165
S-34	00	763	89	852	741
S-35	00	770	73	843	325
S-26	455	269	93	817	995
S-32	00	577	63	640	553
S-14	00	409	113	522	227
S-21	00	392	24	416	269
S-30	00	196	123	319	221
S-19	00	231	83	314	310
S-13	00	263	9	272	166
S-33	00	232	19	251	118
S-36	00	167	74	241	170
S-40	00	126	90	216	673
S-17	00	108	96	204	237
S-39	00	141	43	184	221
S-38	00	68	115	183	82
S-27	00	91	90	181	337
S-44	00	29	143	172	205
S-20	00	162	7	169	70
S-15	00	71	91	162	39
S-24	00	38	111	149	176
S-18	00	30	115	145	152
S-12	00	91	49	140	86
S-16	00	40	67	107	74
S-11	00	00	89	89	87
S-43	00	48	39	87	121
S-31	00	00	85	85	1
S-37	00	00	85	85	47
S-25	00	4	69	73	37
S-10	00	00	44	44	3
S-42	00	15	23	38	32
S-29	00	00	36	36	5
S-23	00	00	30	30	23
S-28	00	00	28	28	2
S-41	00	00	15	15	1
Total	8,190	9,560	3,217	20,967	21,419
Mean	186.14	217.36	73.11	476.61	486.79
Range:	0-1,190	0-1,032	7-143	15-1,894	1-2,351

Note:—Based on the first period of 20 days of contingent reinforcement.

procedure by delivering tokens for an alternative non-preferred response or by delivering them independently of behavior. In this experiment, the tokens were removed from circulation while the events hitherto used for reinforcement were made freely available to the patients. The absence of tokens, combined with the free availability of reinforcers, approximates the usual manner in which mental hospital wards are managed.

After Exp III, the usual token reinforcement procedure was reinstated for approxi-

mately 45 days. Patients signed up for on-ward job assignments, and tokens were given immediately after the assignments were successfully completed.

Patients

Forty-one of the 44 patients studied had also participated in Exp III. Of the remaining three patients in Exp III, two had been discharged from the hospital, and one had been transferred off the ward because of a chronic physical illness. Three new patients were added to the ward at least 21 days before Exp IV, sufficient time for them to function under the token reinforcement procedure. Their diagnosis, medication, and years of hospitalization are presented in Table 9. It can be seen from this and Table 5 that the characteristics of the three new patients did not differ considerably from many of the other 41 patients.

Procedure

The present study was concerned with performance of the on-ward jobs described in Table 6. As in the previous experiments, the automatic job rotation procedure was discontinued for the duration.

The experiment lasted 45 days. During the first 15 days, the token reinforcement was given immediately upon satisfactory completion of the performance, and the tokens could be exchanged for the various reinforcers. From Day 16 to 30, all tokens were removed from the ward, except for those in the personal possession of the patients. Upon completion of any job assignment no tokens were given to the patient. The various reinforcing events were made freely available to all patients, and tokens could not be used to obtain any of the reinforcers. All patients could go on a walk, have private talks with the staff, go to the dances and have their choice of the various commissary items. On the first day that the tokens were discontinued, the attendants gave the following instructions to each patient:

> "For the next couple of weeks or so, we are going to have an inventory of all the tokens on the ward. This means that we are going to spend a lot of our time counting all of the tokens that we have in our office. During this time we will not be giving tokens for work on the ward, and also, there won't be any need for you to exchange tokens. Everyone will stay in the same sleeping rooms and the same eating groups that they are in right now. If you have a grounds pass, you can keep using it without having to exchange tokens for it. Commissary items will be available free; so you won't need any tokens for that either. Now, it is up to you if you want to continue working. We won't have any tokens to give you for it."

On Day 31, the standard token reinforcement procedure was reinstated, and instructions were given to each patient by the ward attendant as follows:

> "The inventory period is over. We have finished counting the tokens that we had in our office. From now on you'll receive the usual tokens as soon as you have completed your jobs."

The job made available to each patient was the one she had before the tokens were discontinued.

Results

Figure 5 shows the number of hours of work per day during the 45-day experimental

Table 9

Age, Years of Hospitalization, Diagnosis and Drugs for the Three Patients Who Replaced S-3, S-7 and S-29 During Experiment IV

Subject	*Age*	*Years of Hospitalization*	*Diagnosis*	*Tranquilizing Drugs*
S-45	31	2	schizophrenic reaction, chronic undifferentiated type	phenothiazine derivative
S-46	55	31	schizophrenic reaction, catatonic type	phenothiazine derivative
S-47	37	17	schizophrenic reaction, mixed type	phenothiazine derivative

Note:—See Table 8 for information on the number of tokens received and spent by S-3, S-7 and S-29.

period. For the first 15 days, under the usual token reinforcement, about 45 hr of work was performed each day. While the token reinforcement was discontinued (Days 16-30), the hours of performance dropped rapidly to less than one-fourth the previous level, apparently stabilizing at about 10 or 11 hr per day. On the 31st day, when the token reinforcement procedure was reinstated, performance increased immediately to its previous level of approximately 45 hr per day.

Table 10 shows that all 36 patients who had job assignments worked less when the token reinforcements were discontinued. Eight patients had no job assignment. Although all 36 patients showed a decrease in performance when the tokens were discontinued, the magnitude differed among patients. Twenty-six of the 36 patients performed 5 min or less of work each day. Each of the other 10 patients continued to work for an average of 60 min per day. This group frequently commented that they preferred to perform some work despite the absence of tokens, since there was "nothing else to do".

Table 10 also shows that when the token reinforcement procedure was reinstated, all 36 patients who had been working increased their performance.

Discussion

The virtually complete elimination of the tokens from the ward reduced performance of all patients. These results, together with the findings of Exp I, II, and III, show that the token reinforcement procedure was indeed effective in maintaining performance as compared with either reinforcement for an alternative response, token reinforcement independent of responses, or no token reinforcement.

One puzzling aspect of the results was that performance did not reach the near-zero level in the complete absence of tokens as it had in Exp III, when tokens were delivered independently of behavior. Ten patients out of 36 continued working in the absence of tokens, albeit at a reduced level. The patients' comments suggested that staff-patient interaction during the exchange of tokens might have been an important consideration. In Exp III, patients may have been receiving some type of social reinforcement when the ward attendant gave them the tokens. In the present experiment, however, no such reinforcement could take place because the procedure eliminated token transactions. It is possible that the absence of social interaction with the attendants during token transaction deprived the patients of social reinforcement. In an attempt to obtain it they performed their job assignments. The job assignments were supervised by an attendant and always involved some patient-attendant interaction. Whatever the nature of the reinforcement, there did seem to exist some level of uncontrolled reinforcement for these 10 patients to continue to perform their job assignments. This continued performance in the absence of token reinforcement provided an excellent opportunity to ascertain the strength of this uncontrolled reinforcement.

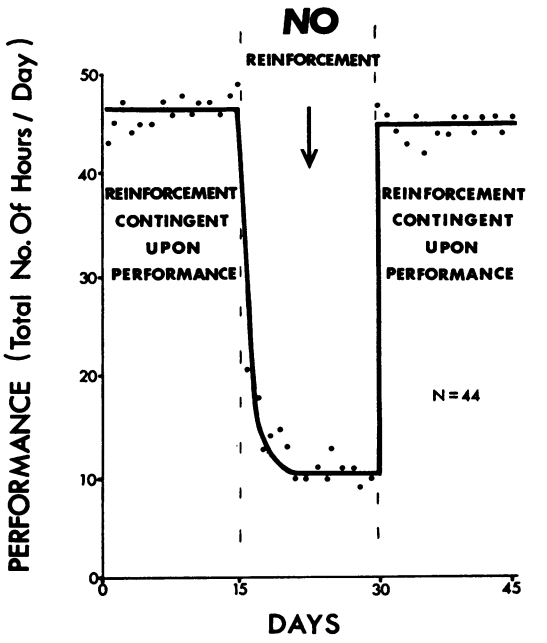

Fig. 5. The total number of hours of on-ward performance by a group of 44 patients, Exp IV.

EXPERIMENT V

Ten patients from Exp IV had been freely selecting job assignments each day without interruption for a period of 45 days. This experiment examined whether the token reinforcement procedure would be strong enough to cause the patients to discontinue their long-standing preferred job assignment and to select a non-preferred job. The general proce-

Table 10

Performance of the Patients After Responsive-Reinforcement Relations Were Altered (Exp IV)

	No Token reinforcement	*Reinstatement of Token reinforcement*
Number of patients showing an increase in performance.	0	36
Number of patients showing a decrease in performance.	36	0
Number of patients showing zero minutes of performance.	8	8
Total number of patients.	44	44

Note:—Based on the terminal five days for each phase.

dure was similar to that used in Exp I, which was concerned with the off-ward rather than on-ward job assignments. The patient was given a choice between the preferred job, which provided few tokens, and a non-preferred job that provided a large number of tokens.

Patients

The 10 patients from Exp IV who had continued with their preferred job assignment in the absence of token reinforcement were used. Table 11 shows their psychiatric classification, age, years of hospitalization, and tranquilizing medication. Nine were classified as schizophrenic and one as mental defective. The average age was 56 and the average duration of continuous hospitalization was 15 years. Seven of the patients received no tranquilizers; the other three received phenothiazine derivatives on a maintenance dosage.

Procedure

Immediately after Exp IV, the token reinforcement procedure was reinstated for all 44 patients for the job assignment each patient had been performing at the start of Exp IV. For the 10 patients considered here, a choice was offered between this preferred job and a second, non-preferred job that required an equivalent amount of time. One token was provided for performing the non-preferred job whereas an average of 83 tokens was provided for the preferred job. On the seventh day the token contingencies were reversed. On the 13th day the token contingencies were returned to the original status. The total experimental period was 18 days. The patients were told the number of tokens each day as they signed up for their job assignments and were offered a choice of one or the other job assignment, never both. The ward attendants

Table 11

Age, Years of Hospitalization, Diagnosis and Drugs for the 10 Patients Studied in Experiment V

Subject	*Age*	*Years of Hospitalization*	*Diagnosis*	*Tranquilizing Drugs*
S-5	72	8	schizophrenic reaction, paranoid type	phenothiazine derivative
S-9	65	22	schizophrenic reaction, paranoid type	none
S-13	56	1	schizophrenic reaction, paranoid type	none
S-14	58	7	schizophrenic reaction, mixed type	none
S-17	45	10	mental defective, severe with psychotic reaction	none
S-22	59	4	schizophrenic reaction, chronic undifferentiated type	none
S-32	46	16	schizophrenic reaction, paranoid type	phenothiazine derivative
S-33	39	20	schizophrenic reaction, hebephrenic type	phenothiazine derivative
S-35	62	29	schizophrenic reaction, catatonic type	none
S-40	58	33	schizophrenic reaction, hebephrenic type	none

Mean Age: 56 Range: 39-72 Years

Mean Years of Hospitalization: 15 Range: 1-33 Years

informed patients verbally of the changing number of tokens for the two assignments. During Phase I the instructions given to each of the patients, individually, were:

> "As you know we have patients who would like to change jobs from time to time. This week we have several people who are interested in the same job you're doing. Since we want to be fair, we would like to give you the choice to keep your job or to get another job. Now you should know that your present job will pay 80 tokens. We have a second job which is __ _____, and that pays one token. Which do you want?"

During Phase II, the instructions given to each patient were modified as follows to indicate the change in the number of tokens offered:

> ". . . your present job will pay one token. We have a second job which is _____, that pays 80 tokens. Which one do you want?"

During Phase III, the procedure reinstated the greater token reinforcement for the preferred job and the smaller one for the non-preferred job.

Results

Figure 6 shows the duration of performance on the preferred and non-preferred job assignments for nine of the 10 patients. The tenth patient is considered separately. For the first six days these nine patients worked exclusively on the preferred job, which earned the larger number of tokens. On Day 7, when the larger number of tokens was earned on the non-preferred job assignment, the nine patients worked exclusively on the non-preferred job for Days 7-12. On Day 13, when the larger number of tokens was again earned by the preferred assignment, these patients immediately selected the preferred jobs and continued on them for the duration of the experiment.

The tenth patient continued working on the preferred job with the smaller number of tokens from Day 7-12. (See Fig. 7) On Day 13, she changed to the non-preferred job. During an additional five days in which the preferred job earned fewer tokens, this patient continued to select the non-preferred job with its larger number of tokens. On Day 19, the contingency was reversed. The patient immediately selected the preferred job assignment and continued with it for the duration of the experiment.

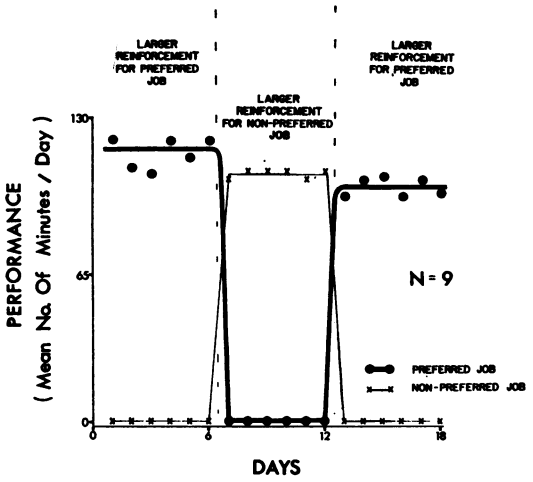

Fig. 6. Mean number of minutes of performance by nine of 10 patients.

Discussion

All patients discontinued their preferred job despite a long-standing preference. Both jobs were of the same duration, and both provided the opportunity for social reinforcement associated with the token exchange. The choice of jobs was determined by the relative number of tokens, and not by any reinforcement intrinsic to the job.

EXPERIMENT VI

Experiments I-V found that performance was reduced or eliminated when the response-reinforcement relationship was changed, and returned when the response-reinforcement was reinstated. In each case, the change in the response-reinforcement relationship was indicated by the attendant's spoken instructions to the patients. Orally conveyed instructions are difficult to standardize. They may convey some unintended cue. The attendant's intonation or facial expression may lead the patient to believe that she should stop or start working. The present experiment attempted to replicate the procedure of Exp I with a similar number of patients, using written, rather than spoken, communication.

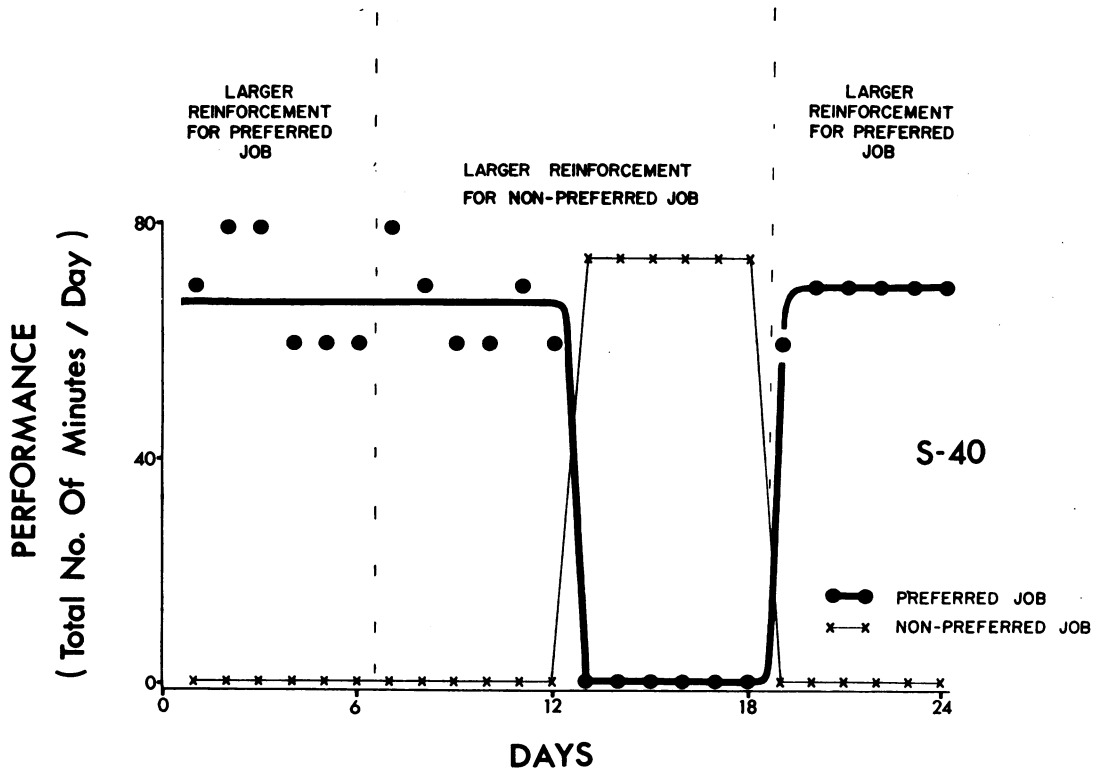

Fig. 7. Total number of minutes of performance by one patient, S-40.

Patients

The five patients in this experiment had participated in Exp I. Of the other three patients in Exp I, one had a heart condition that precluded a full day's work, and the other two had been discharged from the hospital.

Procedure

The present experiment was conducted two months after Exp V and lasted 15 days. Each patient was given a choice of job assignments typed on the assignment sheet, which she carried when reporting to her assignment each morning. The assignment sheet told the patient where to report and the number of tokens that would be earned for that job. One of the assignments was the preferred job as ascertained by the patient's selection during the preceding two-week period. The second job was of equivalent duration but had not been selected by the patient during the preceding two weeks. For Days 1-5, 70 tokens could be earned for the preferred job assignment and none for the non-preferred job assignment. For Days 6-10, no tokens were listed for the preferred, 70 for the non-preferred job. On days 11-15, the numbers were again reversed. At the time each patient picked up her assignment sheet from the nurse's station in the morning, she notified the attendant of her selection; the attendant recorded the information but did not reply in any way. When the patient asked the attendant what the change in numbers meant, the attendant replied, "Whatever it says on the assignment sheet."

Results

The results were almost identical to those of Exp I. All five patients discontinued the preferred job when tokens were reduced from 70 to 0. All resumed working at the preferred job when the number of tokens for that job was returned to 70. The shift in performance was immediate for four of the five patients. The fifth patient did not notice that the number of tokens had changed, and on the sixth day completed a full day's work. After she discovered that no tokens were scheduled for that job, she selected the non-preferred job assignment. On the 11th day, all patients im-

mediately shifted to the job assignment that earned 70 tokens.

Discussion

Oral instructions played no major role in determining the choice of job assignment. Even when the change in the number of tokens was indicated only in written numerical form, the change in performance was immediate and complete. It must be concluded, therefore, that the choice of jobs as well as the degree of performance was governed by the token reinforcement procedure and not by the oral instructions of the attendants. This finding agrees with previous results (Ayllon and Azrin, 1964) which showed that instructions had no enduring or consistent effect in modifying adaptive behavior of chronic mental patients unless the instructions were accompanied by favorable consequences for following them. Yet it would be incorrect to assume that verbal instructions were unnecessary. The same study showed that instructions provided important discriminative stimuli for initiating behavior: "By utilizing the existing verbal repertoire of humans, the instructions eliminate the necessity of arduous and impractical shaping procedures such as must be used with animals" (Ayllon and Azrin, p. 330). For this reason the present reinforcement program used verbal instructions wherever possible to initiate behavior that could then be reinforced.

CONCLUSION

The results of the six experiments demonstrate that the reinforcement procedure was effective in maintaining desired performance. In each experiment, the performance fell to a near-zero level when the established response-reinforcement relation was discontinued. On the other hand, reintroduction of the reinforcement procedure restored performance almost immediately and maintained it at a high level for as long as the reinforcement procedure was in effect. The reinforcement procedure effectively maintained performance both on and off the experimental ward. The standard procedure for reinforcement had been to provide tokens contingent upon the desired performance and to allow exchange of the tokens for a variety of reinforcers. Performance decreased when this response-reinforcement relation was disrupted (1) by delivering tokens independently of the response while still allowing exchange of tokens for the reinforcers (Exp II and III), (2) by discontinuing the token system entirely but providing continuing access to the reinforcers (Exp IV), or (3) by discontinuing the delivery of tokens for a previously reinforced response while simultaneously providing tokens for a different, alternative response (Exp I and VI). Further, the effectiveness of the reinforcement procedure did not appear to be limited to an all-or-none basis. Patients selected and performed the assignment that provided the larger number of tokens when reinforcement was available for more than one assignment (Exp V).

A major problem in designing the reinforcement procedure was to discover reinforcers for chronic mental patients. The principle adopted was to use as reinforcers the opportunity to engage in behaviors that already existed in high strength. This allowed wide differences in personal preferences and changing interests. Such diverse events as leave from the ward, a personal screen for privacy, an extra opportunity to speak with the chaplain, choice of chair, *etc.*, have never before been systematically utilized in patient treatment. Yet the frequency of usage of these events indicates that they constitute a relatively strong, albeit untapped, source of motivation for mental patients.

Since the reinforcers were based on existing behavior, the number of reinforcing events for a given patient depended on that patient's level of existing behavior. For the great majority of these patients, behaviors of some sort could be identified and programmed as a reinforcer. Table 8 shows that half of the patients expended more than 200 tokens and as many as 2400 tokens within 20 days. For these patients, the reinforcers were being actively and continually used as a means of motivation. Eight patients, who expended fewer than 50 tokens within 20 days, all earned by self-care rather than from job assignments, were relatively unaffected by the reinforcement procedure. Statistical comparison of them with the other patients revealed no difference in diagnosis or age. It appears that their failure to modify behavior appreciably stemmed from the relative absence of any strong behavior

patterns that could be used as reinforcers. The only two behaviors that existed in strength were sleeping and eating. The present program did not attempt to control the availability of food. This action may have to be considered in future research in order to rehabilitate patients with such an extreme loss of behavior. Such patients appear to be a rarity under current methods of hospital treatment. The long-term hospitalization of these patients (10-20 years) may have extinguished many behavior patterns that existed at the time of initial hospitalization, a loss that has been described elsewhere as disculturation (Goffman, 1961; Sommer and Osmond, 1961). The favorable results obtained with the other patients suggest that adjustive behavior might have been created with these behaviorally debilitated patients if the present type of procedure had been initiated earlier when some behavior patterns were still intact.

The primary function of the tokens was to bridge the delay between the response and the delivery of the reinforcement. The tokens also provided an objective record of reinforcement delivery and permitted an objective check by the supervising personnel on the appropriate occurrence of the conditioned reinforcement procedure. Also, the attendants did not have to be concerned about voice tone or facial expression as they would if they were delivering a social or verbal type of reinforcement. From the patient's point of view, the token provided an unambiguous indication of approval independent of the attendant's particular mood or whim at the time of delivery. Further, the token procedure eliminated the need to discover what reinforced the patient when the response occurred. It was necessary only to deliver the tokens and allow the patient complete self-expression of her individual preferences at a later time when the token could be exchanged for a wide variety of different reinforcers (Ferster, 1961). Most important, the objectivity of the procedure guaranteed that the patient would be reinforced even for minimally useful responses, thereby freeing the attendants and the staff from the need to define what was "normal" or worthy of being rewarded.

The effectiveness of the reinforcement program was not restricted by any identifiable trait or characteristic of the patients. The primary limitation was the patient who had lost almost all behavior. Age had no discernible limit on effectiveness. Subjects' ages ranged from 24-74 years. Nor was IQ a limitation. Three mental defectives were treated (including one Mongoloid) as well as many high school graduates and one college graduate. No particular type of diagnosis proved to be especially restrictive; the diagnosis included manic-depression, paranoid schizophrenia, and one diagnosis of brain disorder attributable to syphilitic encephalitis. Length of hospitalization of the patients was as little as one year and as long as 37 years.

A fundamental objective of the present research was to develop methods that enable mental patients to function independently and effectively. The degree of success achieved raises practical questions of how this type of treatment program relates to therapeutic objectives, administrative feasibility, cost, *etc.* A discussion of administrative implications will be presented elsewhere. The present report is primarily concerned with theoretical rationale, methodological principles, and experimental findings.

There is growing evidence of the general applicability of this social reinforcement program. It has been adopted with almost no change by Spradlin (personal communication) at Parsons State Hospital for use with mentally retarded children. Similarly, this program has been adopted with slight changes by L. Krasner (personal communication) at a VA mental hospital for use with male adult psychotics and with more extensive changes by H. Cohen (personal communication) for use with juvenile delinquents at the National Training School for Boys.

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